

What is claimed is:

1. A ruled line extracting apparatus,  
comprising:

5       estimating means for estimating a size of a  
standard pattern included in an input image; and  
straight line extracting means for setting a  
threshold value based on information of the size of  
the standard pattern, and extracting information of  
10       one or more straight line patterns from the input  
image using the threshold value.

2. The ruled line extracting apparatus according  
to claim 1, wherein said estimating means estimates  
15       a size of a character pattern included in the input  
image as the size of the standard pattern.

3. The ruled line extracting apparatus according  
to claim 1, wherein said estimating means estimates  
20       the size of the standard pattern based on a histogram  
of sizes of pixel concatenation regions included in  
the input image.

4. The ruled line extracting apparatus according  
25       to claim 1, wherein said straight line extracting

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means includes:

straight line deleting means for determining whether or not to delete one of the one or more straight line patterns, by using the threshold value and at least either of information about a shape of one among one or more straight line patterns, and information about a distance between two straight line patterns included in one or more straight line patterns.

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5. The ruled line extracting apparatus according to claim 1, wherein said straight line extracting means includes:

straight line deleting means for determining whether or not to delete either of a horizontal straight line pattern and a vertical straight line pattern included in the one or more straight line patterns, based on a link relationship between the horizontal straight line pattern and the vertical straight line pattern and the threshold value.

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6. The ruled line extracting apparatus according to claim 1, wherein said straight line extracting means includes:

25 straight line deleting means for determining

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whether or not to delete a shorter pattern of two straight line patterns which are included in the one or more straight line patterns and almost overlap, using the threshold value.

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7. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image;

calculating means for obtaining a representative value of sizes of the one or more straight line patterns;

and

straight line processing means for setting a threshold value based on the representative value, and processing the information of the one or more straight line patterns using the threshold value.

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8. The ruled line extracting apparatus according to claim 7, wherein said calculating means obtains the representative value according to either of a histogram of heights of horizontal straight line patterns included in the one or more straight line patterns, and a histogram of widths of vertical

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straight line patterns included in the one or more straight line patterns.

9. The ruled line extracting apparatus according to claim 7, wherein said straight line processing means further comprises a straight line integrating means for recognizing a straight line pattern after integration as a ruled line candidate, if a size of the straight line pattern generated by integrating two straight line patterns which partially overlap among the one or more straight line patterns, is approximately the representative value.

10. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image;

calculating means for obtaining a representative value of sizes of one or more segment patterns structuring the one or more straight line patterns; and

straight line processing means for setting a threshold value based on the representative value, and processing the information of the one or more straight



line patterns using the threshold value.

11. The ruled line extracting apparatus according to claim 10, wherein said calculating means obtains the representative value according to either of a histogram of heights of horizontal segment patterns included in the one or more segment patterns, and a histogram of widths of vertical segment patterns included in the one or more straight line patterns.

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12. The ruled line extracting apparatus according to claim 10, wherein said straight line processing means further comprises:

straight line deleting means for deleting a straight line pattern composed of segment patterns which are larger than the threshold value among the one or more straight line patterns.

13. A ruled line extracting apparatus, comprising:

segment extracting means for extracting information of one or more segment patterns from an input image;

storing means for classifying the information of the one or more segment patterns into information of



a large segment pattern and information of a small segment pattern; and

straight line extracting means for examining a link state of the one or more segment patterns, and  
 5 when a large segment pattern is linked to small segment patterns, extracting a straight line pattern composed of the small segment patterns regardless of a size of the large segment pattern.

10 14. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image; and

15 straight line integrating means for integrating two straight line patterns included in the one or more straight line patterns if the two straight line patterns almost overlap .

20 15. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image; and

25 straight line deleting means for determining

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whether or not to delete one among the one or more  
straight line patterns by using at least one of  
information about a shape of the one among the one or  
more straight line patterns, and information about a  
distance between two straight line patterns included  
in the one or more straight line patterns.

16. A ruled line extracting apparatus,  
comprising:

straight line extracting means for extracting  
information of one or more straight line patterns from  
an input image; and

straight line deleting means for determining  
whether or not to delete either of a horizontal  
straight line pattern and a vertical straight line  
pattern included in the one or more straight line  
patterns, based on a link relationship between the  
horizontal straight line pattern and the vertical  
straight line pattern.

17. A ruled line extracting apparatus,  
comprising:

straight line extracting means for extracting  
information of one or more straight line patterns from  
an input image; and



straight line deleting means for deleting a shorter pattern of two straight line patterns which are included in the one or more straight line patterns and almost overlap.

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18. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image; and

straight line integrating means for recognizing a straight line pattern after integration as a ruled line candidate, if a size of the straight line pattern generated by integrating two straight line patterns which partially overlap among the one or more straight line patterns, is approximately a predetermined value.

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19. A ruled line extracting apparatus, comprising:

straight line extracting means for extracting information of one or more straight line patterns from an input image; and

straight line deleting means for deleting a straight line pattern composed of segment patterns which are larger than a threshold value, among the one

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or more straight line patterns.

20. A ruled line extracting apparatus,  
comprising:

5 straight line extracting means for extracting  
information of a straight line pattern from an input  
image;

graph generating means for obtaining the number of  
pixels included in a segment pattern of a standard  
10 size among one or more segment patterns structuring  
the straight line pattern, and generating a graph  
representing the number of pixels around the straight  
line pattern; and

straight line deleting means for determining  
15 whether or not to delete the straight line pattern  
based on a shape of the graph.

21. The ruled line extracting apparatus according  
to claim 20, further comprising:

20 storing means for attaching a mark to information  
of a large segment pattern among the one or more  
segment patterns, and storing information of the one  
or more segment patterns, wherein said graph  
generating means recognizes a segment pattern to which  
25 the mark is not attached among the one or more segment

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patterns as the segment pattern of the standard size.

22. The ruled line extracting apparatus according to claim 20, wherein:

5        said graph generating means shifts the segment pattern of the standard size in a direction perpendicular to a direction of a length of the straight line pattern, and generates the graph representing a relationship between an amount of shift  
10        and the number of pixels; and

      said straight line deleting means deletes the straight line pattern if the shape of the graph is gentle.

15        23. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

      estimating a size of a standard pattern included in an input image;

20        setting a threshold value based on information of the size of the standard pattern; and

      extracting information of one or more straight line patterns from the input image using the threshold value.

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extracting information of one or more straight  
5 line patterns from an input image;

setting a threshold value based on the  
representative value; and

10        processing the information of the one or more  
straight line patterns using the threshold value.

25. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

extracting information of one or more straight  
line patterns from an input image;

obtaining a representative value of sizes of one  
or more segment patterns structuring the one or more  
20 straight line patterns;

setting a threshold value based on the representative value; and

processing the information of the one or more  
straight line patterns using the threshold value.



26. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

5 extracting information of one or more segment patterns from an input image;

classifying the information of the one or more segment patterns into information of a large segment pattern and information of a small segment pattern; and

10 examining a link state of one or more segment patterns, and when a large segment pattern is linked to small segment patterns, extracting a straight line pattern composed of the small segment patterns regardless of a size of the large segment pattern.

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27. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

20 extracting information of one or more straight line patterns from an input image; and

integrating two straight line patterns included in the one or more straight line patterns into one, if the two straight line patterns almost overlap.

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by a computer, to direct the computer to perform the functions of:

extracting information of one or more straight line patterns from an input image; and

5 determining whether or not to delete one among the one or more straight line patterns, using at least either of information about a shape of the one among the one or more straight line patterns, and information about a distance between two straight line  
10 patterns included in the one or more straight line patterns.

29. A computer-readable storage medium, when used by a computer, to direct the computer to perform the  
15 functions of:

extracting information of one or more straight line patterns from an input image; and

determining whether or not to delete either of a horizontal straight line pattern and a vertical  
20 straight line pattern included in the one or more straight line patterns, based on a link relationship between the horizontal straight line pattern and the vertical straight line pattern.

25 30. A computer-readable storage medium, when used

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by a computer, to direct the computer to perform the functions of:

extracting information of one or more straight line patterns from an input image; and

5 deleting a shorter pattern of two straight line patterns which are included in the one or more straight line patterns and almost overlap.

31. A computer-readable storage medium, when used  
10 by a computer, to direct the computer to perform the functions of:

extracting information of one or more straight line patterns from an input image; and

15 recognizing a straight line pattern after integration as a ruled line candidate, if a size of the straight line pattern generated by integrating two straight line patterns which partially overlap among the one or more straight line patterns is approximately a predetermined value.

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32. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

25 extracting information of one or more straight line patterns from an input image; and

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33. A computer-readable storage medium, when used by a computer, to direct the computer to perform the functions of:

10 obtaining the number of pixels included in a segment pattern of a standard size among one or more segment patterns structuring the straight line pattern, and generating a graph representing the number of pixels around the straight line pattern; and

34. A ruled line extracting method, comprising the steps of:

setting a threshold value based on information of the size of the standard pattern; and

extracting information of one or more straight  
25 line patterns from the input image, using the



threshold value.

35. A ruled line extracting method, comprising the steps of:

5 extracting information of one or more straight line patterns from an input image;

obtaining a representative value of sizes of the one or more straight line patterns;

10 setting a threshold value based on the representative value; and

processing the information of the one or more straight line patterns using the threshold value.

36. A ruled line extracting method, comprising the steps of:

15 extracting information of one or more straight line patterns from an input image;

obtaining a representative value of sizes of one or more segment patterns structuring the one or more straight line patterns;

20 setting a threshold value based on the representative value; and

processing the information of the one or more straight line patterns using the threshold value.

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extracting information of one or more segment  
patterns from an input image;

10 examining a link state of one or more segment patterns, and when a large segment pattern is linked to small segment patterns, extracting a straight line pattern composed of the small segment patterns regardless of a size of the large segment pattern.

extracting information of one or more straight  
line patterns from an input image; and

20 integrating two straight line patterns included in  
the one or more straight line patterns, if the two  
straight line patterns almost overlap.

25 extracting information of one or more straight



line patterns from an input image; and

determining whether or not to delete one among the one or more straight line patterns, using at least either of information about a shape of the one among the one or more straight line patterns, and information about a distance between two straight line patterns included in the one or more straight line patterns.

10 40. A ruled line extracting method, comprising the steps of:

extracting information of one or more straight line patterns from an input image; and

15 determining whether or not to delete either of a horizontal straight line pattern and a vertical straight line pattern included in the one or more straight line patterns, based on a link relationship between the horizontal straight line pattern and the vertical straight line pattern.

20 41. A ruled line extracting method, comprising the steps of:

extracting information of one or more straight line patterns from an input image;

25 deleting a shorter pattern of two straight line

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patterns which are included in the one or more straight line patterns and almost overlap.

42. A ruled line extracting method, comprising  
5 the steps of:

extracting information of one or more straight line patterns from an input image;

10 recognizing a straight line pattern after integration as a ruled line candidate, if a size of the straight line pattern generated by integrating two straight line patterns which partially overlap among the one or more straight line patterns, is approximately a predetermined value.

15 43. A ruled line extracting method, comprising the steps of:

extracting information of one or more straight line patterns from an input image; and

20 deleting a straight line pattern composed of segment patterns which are larger than a threshold value, among the one or more straight line patterns.

44. A ruled line extracting method, comprising the steps of:

25 extracting information of a straight line pattern

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from an input image;

obtaining the number of pixels included in a  
segment pattern of a standard size among one or more  
segment patterns structuring the straight line  
5 pattern, and generating a graph representing the  
number of pixels around the straight line pattern; and

determining whether or not to delete the straight  
line pattern based on a shape of the graph.

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